

NON-PUBLIC?: N  
ACCESSION #: 9005220105  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: DIABLO CANYON UNIT 1 PAGE: 1 OF 6

DOCKET NUMBER: 05000275

TITLE: REACTOR TRIP DUE TO LOW-LOW LEVEL IN STEAM GENERATOR 1-4  
FOLLOWING THE TRIP OF MAIN FEEDWATER PUMP 1-2 DUE TO LACK OF  
ADEQUATE DOCUMENTATION OF CHANGE OF DESIGN  
EVENT DATE: 08/30/88 LER #: 88-025-01 REPORT DATE: 05/14/90

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 099

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION:  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:  
NAME: TERENCE L. GREBEL, REGULATORY COMPLIANCE SUPERVISOR

TELEPHONE: (805) 595-4720

COMPONENT FAILURE DESCRIPTION:  
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:  
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On August 30, 1988, at 2042 PDT. a Unit 1 reactor trip occurred following the trip of main feedwater pump (MFWP) 1-2. The Unit was stabilized in Mode 3 (Hot Standby), and the 4-hour non-emergency report required by 10 CFR 50.72(b)(2)(ii) was made on August 30, 1988, at 2142 PDT.

MFWP 1-2 tripped on overspeed when the feed pump turbine governor valves fully opened due to a pressure build-up in the signal air line to the MFWP control valve positioners. The pressure build-up resulted from leakage into the isolated manual regulator line. The line was isolated due to a closed isolation valve in the line between the high select and the manual regulator. This valve had been installed by the vendor as a vendor field change prior to installation of the MFWP control system in

Unit 1. The root causes were determined to be both the failure of the vendor to document a change of design, and failure of the PG&E organization requesting the change to document that request and verify appropriate document revision.

Personnel awareness regarding plant configuration change requirements has been heightened through revision and enhancement of procedures which govern initiation and implementation of design changes.

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END OF ABSTRACT

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## I. Initial Conditions

Unit 1 was in Mode 1 (Power Operation) at approximately 99 percent power.

## II. Description of Event

### A. Event:

On August 30, 1988, at 2042 PDT. Unit 1 experienced a reactor trip due to low-low water level in steam generator (SG) 1-4 (AB)(SG). The low-low steam generator water level condition occurred as the result of the tripping of main feedwater pump (MFWP) 1-2 (SJ)(P).

At approximately 2035 PDT, the Unit 1 Control Operator (CO) lowered demand on the MFWP 1-2 manual controller (JK)(SCO). The pressure input to the high select module decreased below the pressure inside its manual input line, which had developed due to a closed isolation valve in the manual input line. The high select module then automatically switched its input to the manual input line, which, without a vent path, resulted in a rapid increase in the control air pressure. This increase in control air pressure was sensed as a high demand signal by the high select module, and caused the MFWP valve positioners (JK)(SCV) to rapidly move to their full-closed position (maximum steam flow demand). This resulted in MFWP governor valves (JK)(SCV) fully opening and a rapid increase in MFWP turbine (SB)(TRB) speed, which continued until the overspeed trip setpoint was reached, resulting in the MFWP 1-2 trip at 2041 PDT.

The unit was stabilized in Mode 3 (Hot Shutdown) in accordance with approved Plant emergency procedures. The four-hour non-emergency report required by 10 CFR 50.72 was made at 2142 PDT.

B. Inoperable structures, components, or systems that contributed to the event:

None.

C. Dates and approximate times for major occurrences.

1. August 30, 1988, at 2041 PDT: MFWP 1-2 tripped.
2. August 30, 1988, at 2042 PDT: Event Date - Reactor tripped due to low-low water level in SG 1-4.
3. August 30, 1988, at 2142 PDT: 4 hour non-emergency notification to NRC as required by 10 CFR 50.72.
4. August 30, 1988, at 2200 PDT: Unit stable in Mode 3.

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D. Other systems or secondary functions affected:

None

E. Method of discovery:

The event was immediately apparent due to alarms and other indications in the control room.

F. Operator actions:

When the MFWP tripped, operators reduced the turbine load in an unsuccessful attempt to reduce the steam demand on the steam generators. Upon receipt of reactor trip alarms, the plant operating personnel entered the appropriate emergency operating procedures and stabilized the unit in Mode 3 (Hot Standby).

#### G. Safety system responses:

1. Reactor trip breakers (JC)(BKR) opened.
2. The control rod drive mechanisms (AA)(DRIV) allowed the control rods to drop into the reactor (AC)(RCT).
3. The turbine (TA)(TRB) tripped.
4. Auxiliary feedwater pumps (BA)(MO)(P) started as per design.
5. Main feedwater (SJ) was isolated.

#### III. Cause of Event

##### A. Immediate cause:

Reactor tripped due to low-low water level in steam generator 1-4. The low-low steam generator level was caused by the overspeed trip of MFWP 1-2. The MFWP 1-2 trip was determined to be due to overspeed, because a trip on high discharge pressure would annunciate as such in the control room. No annunciation of MFWP 1-2 trip on high discharge pressure was received in the control room during this event.

##### B. Root cause:

Initial investigation of the August 30, 1988, reactor trip identified the cause of this event to be a faulty turbine speed sensor. The speed sensor was thought to be the cause of the trip based on trouble with the annunciation of the MFWP speed control system in the control room. Additionally, the speed probe was found to be improperly installed, and the event could have been indicative of the type of failure expected due to improper installation. The suspect speed sensor was removed and later analyzed by the vendor, and was determined to be operable. On

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September 26, 1988, MFWP 1-2 was being brought down to investigate another problem. As the pump speed was ramped down, the speed suddenly increased and caused a pump trip on overspeed. The symptoms of the second pump trip were identical

to those of the first, with the exception that a reactor trip on SG low-low water level did not occur after the second pump trip. Further investigation showed the cause of both MFWP trips to be high pneumatic pressure trapped in the manual regulator input air line to the MFWP valve positioners, which, as described above, caused the MFWP turbine governor valves to fully open, leading to a turbine overspeed condition. Build-up of this high pneumatic pressure was caused by a combination of factors:

1. Leakage of instrument air through the valve positioners from the supply connection to the signal connection and into the high select module.
2. Leakage of instrument air through the high select module into its manual regulator input line due to an accumulation of foreign material from the instrument air system.
3. The presence of a closed isolation valve in the manual regulator input line to the high select module.

The isolation valve was installed in the manual regulator input line by the vendor as a vendor field change prior to installation of the MFWP controller system in Unit 1. Subsequent investigation determined that this valve was inappropriately located, in that when closed in that location it resulted in blocking the normal vent path in the manual regulator input line. Blocking the normal vent path allowed the air leaking in to become trapped and pressure to build up in the manual regulator line. This valve had been installed per a verbal request by PG&E.

The root causes of this event are considered to be both the failure of the vendor to document a change of design, and failure of the PG&E organization requesting the change to document that request and verify appropriate vendor document revision. The failure to do either of these resulted in the failure to obtain adequate failure analysis of the isolation valve configuration.

#### C. Contributory cause:

A contributory cause to this event is equipment deficiency due to inadequate preventive maintenance. A failure to perform adequate preventive maintenance

ance on the instrument air system resulted in accumulation of foreign material in the system, causing air leakage into the manual regulator input line. Corrective actions for the inadequate instrument air system preventive maintenance have been evaluated, and changes are in progress as part of PG&E's response to NRC Generic Letter 88-14, "Instrument Air Supply System Problems Affecting Safety-Related Equipment."

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#### IV. Analysis of Event

##### A. Safety Analysis

The loss of normal feedwater is a previously analyzed condition II event. The reactor trip on August 30, 1988, occurred on low-low steam generator level as a result of the trip of MFWP 1-2. Per design, the automatic start of the two motor-driven auxiliary feedwater (AFW) pumps ensured an adequate supply of water to the steam generators to provide for the cooldown of the reactor. The trip of MFWP 1-2 on September 26, 1988, was a repeat of the August 30, 1988, MFWP 1-2 trip; however, it did not result in a reactor trip or the initiation of AFW operation because a steam generator low-low level condition did not result. Therefore, operation of Unit 1 with the closed valve in the MFWP manual regulator line did not affect the health and safety of the public.

#### V. Corrective Actions

##### A. Immediate Corrective Actions:

1. The possibility of pressure buildup in the line between the manual regulator and high select module (caused by the presence of the isolation valve) was eliminated by depressurizing the line. This was accomplished in Unit 1 by removal of the cap on a tee in that section of the line and in Unit 2 by removal of the end of the line from the high select module. These actions were performed under shift foreman clearances, which will remain in effect until system upgrades are completed.
2. The high select units in Units 1 and 2 MFWPs were inspected and cleaned as necessary to eliminate foreign material.

3. The control valve positioners in Units 1 and 2 MFWPs were tested and replaced as necessary to reduce leakage.

B. Corrective Actions to Prevent Recurrence:

Based on the previous enhancements and revisions to the following procedures, the level of awareness of site personnel and General Office engineering personnel regarding configuration changes has significantly increased since the time of this event. Therefore, no further corrective action is considered necessary.

Nuclear Engineering Manual Procedures (NEMPs):

NEMP 3.6 ON, "Operating Nuclear Power Plant Design Changes," revised October 1, 1989,

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NEMP 4.2, "EMM Preparation, Approval and Issue," revised April 28, 1989,

Administrative and Nuclear Plant Administrative Procedures (AP and NPAPs):

NPAP C-1, "Nuclear Power Plant Modification Program." revised December 29, 1988, AP C-1S1, "Onsite Plant Modification Program," revised December 9, 1989,

AP C-1S2, "Requesting Plant Design Changes and Engineering Evaluations," revised January 23, 1989,

AP C-1S3, "Plant Modification Field Changes," revised April 16, 1987, and

AP C-1S8, "Design Change Operability Testing Program," revised September 15, 1989.

VI. Additional Information

A. Failed Components:

None.

B. Previous LERs:

LER 2-86-012, "Reactor Trip Due to Main Feedwater Pump 2-2 Trip After Failure of the Thrust Bearing Wear Detector Probe," was similar in that a reactor trip occurred after the failure of a main feedwater pump component caused the trip of a main feedwater pump. The corrective actions for the wear detector probe failure event, since it was the first failure of the probe, consisted of replacing the failed probe. Since this failure occurred two and a half years later and involves entirely different components that also do not have a history of previous failures, the corrective action taken as a result of the wear detector failure probe would not have been expected to have prevented this failure.

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Pacific Gas and 77 Beale Street James D. Shiffer  
Electric Company San Francisco, CA 94106 Senior Vice President  
415/973-4684 General Manager  
TWX 910-372-6587 Nuclear Power Generation

May 14, 1990

PG&E Letter No. DCL-90-127

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, D.C. 20555

Re: Docket No. 50-275, OL-DPR-80  
Diablo Canyon Unit 1  
Licensee Event Report 1-88-025-01  
Reactor Trip Due To Low-Low Level In Steam Generator 1-4  
Following the Trip of Main Feedwater Pump 1-2 Due to Lack  
of Adequate Documentation of a Change of Design

Gentlemen:

Pursuant to 10 CFR 50.73(a)(2)(iv), PG&E is submitting the enclosed revision to Licensee Event Report (LER) 1-88-025 concerning a reactor trip due to low-low water in steam generator 1-4 following the trip of main feedwater pump 1-2. This revised LER is being submitted to report



the results of additional information regarding the root cause and corrective actions.

This event has in no way affected the public's health and safety.

Kindly acknowledge receipt of this material on the enclosed copy of this letter and return it in the enclosed addressed envelope.

Sincerely,

J. D. Shiffer

cc: A. P. Hodgdon  
J. B. Martin  
M. M. Mendonca  
P. P. Narbut  
H. Rood  
CPUC  
Diablo Distribution  
INPO

Enclosure

DC1-88-TI-N091

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